

WHAT IS CLAIMED IS:

1 1. A method for measuring angular speed of an object, the
2 method comprising:

3 providing a micromechanical filter apparatus including one or more
4 intercoupled micromechanical elements including a first resonator having a first
5 resonance frequency formed on a substrate and having a drive mode response in a
6 drive mode wherein the filter apparatus has a filter response in a sense mode;

7 coupling the substrate to the object so that the filter apparatus rotates
8 with the object about a first axis;

9 driving the first resonator in the drive mode so that the first resonator
10 vibrates along a second axis at a reference vibration and generates a Coriolis force
11 which causes one of the other elements of the filter apparatus to vibrate along a third
12 axis at an induced vibration; and

13 sensing the induced vibration in the sense mode to obtain a
14 corresponding output signal which represents the angular speed of the object about
15 the first axis.

1 2. The method as claimed in claim 1 wherein the
2 micromechanical elements include a second resonator having a second resonance
3 frequency wherein the resonance frequencies are substantially the same in the drive
4 and sense modes.

1 3. The method as claimed in claim 2 wherein the filter response
2 in the sense mode has a substantially constant amplitude region for a passband of
3 frequencies including the resonance frequencies and wherein the filter response of
4 the filter apparatus in the sense mode is substantially constant about the resonance
5 frequencies.

1 4. The method as claimed in claim 1 wherein the
2 micromechanical elements include second resonator coupled to the first resonator
3 and wherein the first resonator is driven during the step of driving in the drive mode
4 so that the first resonator vibrates along the second axis at the reference vibration

5 and generates the Coriolis force to cause the second resonator to vibrate along the
6 third axis at the induced vibration.

1 5. The method as claimed in claim 4 wherein the resonators are
2 platform resonators.

1 6. The method as claimed in claim 1 wherein the first resonator
2 is comb-driven.

1 7. The method as claimed in claim 1 wherein the step of sensing
2 is performed capacitively.

1 8. The method as claimed in claim 1 wherein Q-multiplication
2 is attained in both the drive and sense modes.

1 9. The method as claimed in claim 4 wherein the resonators are
2 polysilicon resonators.

1 10. The method as claimed in claim 4 wherein the
2 micromechanical elements include a mechanical spring for coupling the resonators
3 together.

1 11. The method as claimed in claim 1 wherein the filter apparatus
2 is a wide passband filter apparatus and wherein the filter response is a wide
3 passband filter response.

1 12. A system for measuring angular speed of an object, the system
2 comprising:

3 a substrate;
4 a micromechanical filter apparatus including one or more
5 intercoupled micromechanical elements including a first resonator having a first
6 resonance frequency formed on the substrate and having a drive mode response in
7 a drive mode wherein the filter apparatus has a filter response in a sense mode and

10055210 - 01230E

8 wherein the filter apparatus rotates with the object about a first axis when the
9 substrate is coupled to the object and the object is rotated;

10 means for driving the first resonator in the drive mode so that the first
11 resonator vibrates along a second axis at a reference vibration and generates a
12 Coriolis force which causes one of the other elements of the filter apparatus to
13 vibrate along a third axis at an induced vibration; and

14 means for sensing the induced vibration in the sense mode to obtain
15 a corresponding output signal which represents the angular speed of the object about
16 the first axis.

1 13. The system as claimed in claim 12 wherein the
2 micromechanical elements include a second resonator having a second resonance
3 frequency wherein the resonance frequencies are substantially the same in the drive
4 and sense modes.

1 14. The system as claimed in claim 13 wherein the filter response
2 in the sense mode has a substantially constant amplitude region for a passband of
3 frequencies including the resonance frequencies and wherein the filter response of
4 the filter apparatus in the sense mode is substantially constant about the resonance
5 frequencies.

1 15. The system as claimed in claim 12 wherein the
2 micromechanical elements include second resonator coupled to the first resonator
3 and wherein the first resonator is driven by the means for driving in the drive mode
4 so that the first resonator vibrates along the second axis at the reference vibration
5 and generates the Coriolis force to cause the second resonator to vibrate along the
6 third axis at the induced vibration.

1 16. The system as claimed in claim 15 wherein the resonators are
2 platform resonators.

1 17. The system as claimed in claim 12 wherein the first resonator
2 is comb-driven.

1 18. The system as claimed in claim 12 wherein the means for
2 sensing includes a capacitor for capacitively sensing the induced vibration.

1 19. The system as claimed in claim 12 wherein Q-multiplication
2 is attained in both the drive and sense modes.

1 20. The system as claimed in claim 15 wherein the resonators are
2 polysilicon resonators.

1 21. The system as claimed in claim 15 wherein the
2 micromechanical elements include a mechanical spring for coupling the resonators
3 together.

1 22. The system as claimed in claim 12 wherein the filter apparatus
2 is a wide passband filter apparatus and wherein the filter response is a wide
3 passband filter response.

1 23. The method as claimed in claim 4 wherein the resonators are
2 disk resonators.

1 24. The method as claimed in claim 4 wherein the resonators are
2 wineglass resonators.

1 25. The system as claimed in claim 15 wherein the resonators are
2 disk resonators.

1 26. The system as claimed in claim 15 wherein the resonators are
2 wineglass resonators.